2.2.

※: here not considering activate function such as relu(), sigmoid()

(a) Input: $\vec{a}^{(0)}$

$\vec{a}^{(1)} = W^{(1)}\vec{a}^{(0)} + \vec{b}^{(1)}$

$\vec{a}^{(2)} = W^{(2)}\vec{a}^{(1)} + \vec{b}^{(2)}$

Output: $\vec{a}^{(3)} = W^{(3)}\vec{a}^{(2)} + \vec{b}^{(3)}$

(b) Input: $\vec{a}^{(0)}$

We know that Output = (a)'s output = $\vec{a}^{(3)} = W^{(3)}\vec{a}^{(2)} + \vec{b}^{(3)}$

∴ to let (a) and (b) have same output

$\vec{a}^{(3)} = W^{(3)}\vec{a}^{(2)} + \vec{b}^{(3)} = W^{(3)}(W^{(2)}\vec{a}^{(1)} + \vec{b}^{(2)}) + \vec{b}^{(3)} = W^{(3)}(W^{(2)}(W^{(1)}\vec{a}^{(0)} + \vec{b}^{(1)}) + \vec{b}^{(2)}) + \vec{b}^{(3)}$

∴ based on the details above,

$\tilde{W}\vec{a}^{(0)} + \tilde{b} = W^{(3)}(W^{(2)}(W^{(1)}\vec{a}^{(0)} + \vec{b}^{(1)}) + \vec{b}^{(2)}) + \vec{b}^{(3)}$

$= W^{(3)}(W^{(2)}W^{(1)}\vec{a}^{(0)} + W^{(2)}\vec{b}^{(1)} + \vec{b}^{(2)}) + \vec{b}^{(3)}$

$= W^{(3)}W^{(2)}W^{(1)}\vec{a}^{(0)} + W^{(3)}W^{(2)}\vec{b}^{(1)} + W^{(3)}\vec{b}^{(2)} + \vec{b}^{(3)}$

$= (W^{(3)}W^{(2)}W^{(1)})\vec{a}^{(0)} + (W^{(3)}W^{(2)}\vec{b}^{(1)} + W^{(3)}\vec{b}^{(2)} + \vec{b}^{(3)})$

∴ $\tilde{W} = W^{(3)}W^{(2)}W^{(1)}$ ///

$\tilde{b} = W^{(3)}W^{(2)}\vec{b}^{(1)} + W^{(3)}\vec{b}^{(2)} + \vec{b}^{(3)}$